

1. A method of chemical mechanical polishing, comprising:  
pressing a substrate against a polishing surface with a controllable pressure;  
creating relative motion between the polishing surface and the substrate at a velocity;

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controlling at least one of the pressure and velocity in response to a signal that  
depends on the friction between the substrate and the polishing surface to maintain a constant  
torque, frictional force, or coefficient of friction.

10 2. The method of claim 1, wherein the controlling step includes varying the  
pressure to maintain a constant torque.

3. The method of claim 1, wherein the controlling step includes varying the  
pressure to maintain a constant friction.

15 4. The method of claim 1, wherein the controlling step includes varying the  
pressure to maintain a constant frictional coefficient.

20 5. The method of claim 1, wherein the controlling step includes varying the  
velocity to maintain a constant torque.

6. The method of claim 1, wherein the controlling step includes varying the  
velocity to maintain a constant friction.

25 7. The method of claim 1, wherein the controlling step includes varying the  
velocity to maintain a constant frictional coefficient.

8. The method of claim 1, wherein the controlling step includes varying the  
velocity and the pressure to maintain a constant torque.

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9. The method of claim 1, wherein the controlling step includes varying the velocity and the pressure to maintain a constant friction.

10. The method of claim 1, wherein the controlling step includes varying the velocity and the pressure to maintain a constant frictional coefficient.

5 11. The method of claim 1, wherein the controlling step includes generating a motor signal representing a current in a motor that creates the relative motion between the polishing surface and the substrate, and deriving a carrier head pressure control signal by subtracting a threshold value from the motor signal.

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12. The method of claim 11, wherein the controlling step includes amplifying or attenuating a difference between the threshold and the motor signal to determine the carrier head pressure control signal.

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13. The method of claim 11, wherein the motor signal is a carrier head control signal, a platen control signal, or a motor current signal.

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14. The method of claim 1, wherein the polishing surface includes a fixed abrasive polishing material.

15. The method of claim 1, wherein creating relative motion includes rotating the polishing surface.

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16. The method of claim 1, wherein creating relative motion includes rotating the substrate.

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17. A method of chemical mechanical polishing, comprising: pressing a substrate against a polishing surface with a controllable pressure; creating relative motion between the polishing surface and the substrate at a velocity; and

controlling the pressure applied by the carrier head in response to a friction between the substrate and the polishing surface to maintain a substantially constant polishing rate.

18. The method of claim 17, wherein the controlling step includes generating a  
5 motor signal representing a current in a motor that creates the relative motion between the polishing surface and the substrate, and deriving a carrier head pressure control signal by subtracting a threshold value from the motor signal.

19. The method of claim 18, wherein the controlling step includes amplifying or  
10 attenuating a difference between the threshold and the motor signal to determine the carrier head pressure control signal.

20. The method of claim 18, wherein the motor signal is a carrier head control signal, a platen control signal, or a motor current signal.

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21. The method of claim 18, wherein the controlling step includes smoothing the carrier head pressure control signal.

22. The method of claim 17, wherein the polishing surface includes a fixed  
20 abrasive polishing material.

23. The method of claim 17, wherein creating relative motion includes rotating the polishing surface.

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24. The method of claim 17, wherein creating relative motion includes rotating the substrate.